Physics results from the STAR experiment at RHIC benefit from production Grid data services.

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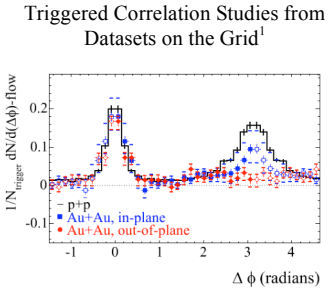
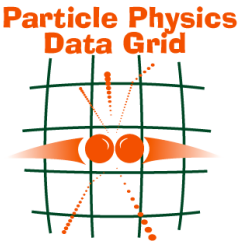
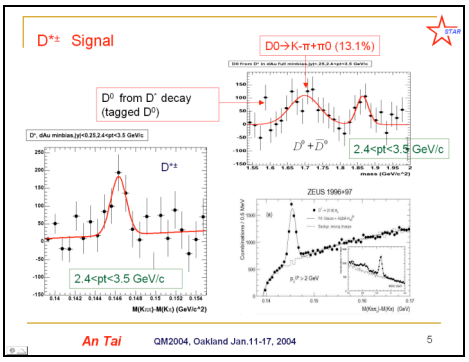




Physics on a Data Grid

A wealth of physics results have emerged from the RHIC[2] program and STAR[3] has published upwards of 50 papers in refereed journals, any of which were published since the start of 2003. The use of a production grid for managed data movement has consistently reduced the time to publication for many STAR physics results.

The first direct measurement[4] of open charm production at RHIC (example below) provided the first salvo of a full program of measurements utilizing the large datasets recorded in the current and future runs at RHIC.



Data Grid Performance

The STAR computing groups at BNL and LBNL have operated the production Grid data movement in collaboration with the LBNL/SDM computer science group. The datagrid is implemented using Storage Resource Manager and Globus Toolkit software, developed with support from other DOE middleware projects, as well as the open source software, MySQL. Sustained robust automated data transfers of up to 5 TB a week are achieved in both directions between the HPSS mass storage systems at BNL and LBNL. This allows "next day" access to data for analysis by the physicists.

Performance is measured regularly and monitoring is used to spot and identify problems in the data transfer. Peak data transfer rates from BNL to NERSC of up to 30 MB/sec are achievable with about 50 streams.

Transfer of Terabyte datasets are accomplished with a single command and the average throughput is 10 times greater than efore the use of Grid tools, mostly due to improved operational efficiencies. Unsuccessful transfers due to transient problems in the end-to-end system, though rare, may be corrected easily by comparing the BNL and NERSC file catalogs to generate a secondary list of files to be transferred. A file discrepancy rate of 0.02%, 50 times less than with the old tools, or less is now obtained with the grid infrastructure.

In addition to bulk data transfer STAR has interfaced its computational workload job submission tool, the STAR Unified Meta Scheduler (SUMS) with the grid and has been using it to run 1000's of simulation jobs at NERSC and automatically transport and archive the output at the RCF, making the results available to the collaboration for data analysis. This utilizes the Condor middleware from the University of Wisconsin as well as the Globus Toolkit.

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[1] K. Schweda, "STAR Experiment Highlights", Quark Matter 2004, http://qm2004.lbl.gov/

[2] www.bnl.gov/RHIC

[3] www.star.bnl.gov

[4] An Tai, "STAR Measurements of Open Charm", Quark Matter 2004, http://qm2004.lbl.gov/